Abstract

Passive Water Management Fuel Cell

A proton exchange membrane (PEM) fuel cell includes fuel and oxidant flow field plates (26, 40) having fuel and oxidant channels (27, 28; 41, 44), and water channels, the ends (29, 48) of which that are adjacent to the corresponding reactant gas inlet manifold (34, 42) are dead ended, the other ends (31, 50) draining excess water into the corresponding reactant gas exhaust manifold (36, 45). Flow restrictors (39, 47) maintain reactant gas pressure above exit manifold pressure, and may comprise interdigitated channels (65, 66; 76, 78). Solid reactant gas flow field plates have small holes (85, 88) between reactant gas channels (27, 28; 41) and water drain channels (29, 30; 49, 50). In one embodiment, the fuel cells of a stack may be separated by either coolant plates (51) or solid plates (55) or both. In a second embodiment, coolant plates (51a) have weep holes (57) that inject water into the ends (29) of the reactant gas water channels which are in the region of the inlet manifold (34), thereby assuring humidification of the reactants.